TRAFFIC ACCIDENTS

Highway traffic accidents have received a great deal of publicity in an effort to educate the driving public. This method of attempting to reduce accidents has been over emphasized. Advantage has been taken of the spectacular publicity value rather than factual data in order to commercialize certain business enterprises. There is no doubt that education is a vital element in reducing accidents but the reductions attributable to it are probably limited to the degree which has already been attained.

Likewise, enforcement has reached concentrations of effort which have probably demonstrated the limit attainable. There are many examples of rigid law enforcement under the disguise of reducing accidents but actually the money raised in fines is the primary incentive.

Gains made in the reduction of accidents up to the present time may be credited to the combination of education, enforcement and engineering. Future gains will be produced by engineering with education and enforcement efforts maintained in order to hold gains already attained.

The accident rate can positively be reduced by building properly designed highways. The designers know how to build these highways and the public wants this type of highway but the money is not made available. They are expensive highways compared to the highways that we have been accustomed to but so too were these highways expensive compared to the horse and buggy roads. The public has got to become educated to the fact that we will have to pay for safety.

Studies of accident data collected over a period of many years produce certain conclusions which aid in planning future types of highways. The larger the sample the better are the conclusions. The New Jersey State Highway Department has prepared accident summaries covering each year from 1935 to the present time and the 10 year period from 1937 to 1946.

Accident, injury and fatality data is obtained from the State Motor Vehicle Department files rather than the files of local police departments. All fatalities get reported, and most of the injuries are probably reported but many accidents not involving injuries or fatalities are not reported. In some locations a greater percentage of the actual number of accidents is reported than in others. This would indicate from statistical analysis that a town with an efficient reporting system was more hazardous than a town with an inefficient reporting system, although the reverse may be true. For analytical comparisons all accidents should be reported with the same degree of efficiency.

The following summary is for the 10 year period from 1937 to 1946 for the entire New Jersey State Highway system, showing the relative hazards by type of road.

NEW JERSEY STATE HIGHWAY SYSTEM

10 YEAR ACCIDENT SUMMARY

BY ROAD TYPE

Road Type	Miles	Average Daily Traffic	100 Million Car Miles	Number of Acc.	Number of Inj.	Number of Fat.	Rate per 100 M.C.M. Acc.	Rate per 100 M.C.M. Inj.	Rate per 100 M.C.M. Fat.
2 lane	1033.53	3,030	114.4278	23,349	17,442	1,040	204	152	9
3 lane	115.14	7,480	31.5514	7,161	5,836	382	228	186	12
4 lane	133.89	13,010	63.5638	19,866	14,003	581	313	220	9
Dual	153.12	11,290	63.1024	15,274	10,817	473	242	171	7
6 lane	2.15	31,790	2.4951	827	668	15	331	268	6
Misc.	202.18	7,000	51.6301	14,085	9,895	500	273	192	10
TOTAL	1640.01	5,460	326.7706	80,562	58,661	2,991	247	180	9

The 6 lane type is too small to be significant. The miscellaneous type are roads that cannot be classified by type in conjunction with the accidents because the roads are composed of more than one road type, such as 3 lanes for part of the way and dual for the rest of the way through a municipality and the accidents cannot be definitely assigned to either road type. The 6 lane and miscellaneous types are included in the summary in order to complete the data for the total highway system.

The 4 lane type is more clearly defined as the 4 lane undivided type. The dual type means 4 lane divided roads including a very few miles of 6 lane divided roads.

In order to compare the relative safety of each road type the following is extracted from the above table.

10 YEAR SUMMARY - 1937 to 1946

RATE PER 100,000,000 CAR MILES

	Accidents	Injuries	Fatalities
2 lane	204	152	9
3 lane	228	186	12
4 lane	313	220	9
Dual	242	171	7

Rearranging in the order of severity for each accident type:

10 YEAR SUMMARY - 1937 to 1946

BY SEVERITY

RATE PER 100,000,000 CAR MILES

Accidents		Injuries		Fatalities	
2 lane	204	2 lane	152	Dual	7
3 lane	228	Dual	171	2 lane	9.09
Dual	242	3 lane	186	4 lane	9.14
4 lane	313	4 lane	220	3 lane	12

This table is helpful in understanding the relative safety values of the different types of road. The 3 lane road has long been a type of road which was claimed by many, especially the general public, to be the most dangerous road but those who analyzed the data found much reason to the contrary. This present analysis concludes that it is a dangerous road.

In analyzing data which is not a big enough sample erroneous conclusions may be made. It is true that some 3 lane roads prove to be safer than some dual roads. The 3 lane road has a much greater capacity than the two lane road and, in locations where peak traffic volumes are in one direction with the opposite direction very small, the 3 lane road has a capacity equal to the 4 lane road. The engineer, therefore, utilized the 3 lane road rather than the 4 lane road as a principle of economy. He may have analyzed the accident rate rather than the injury or fatality rate.

Some analysts demonstrated that the 3 lane road was safer than the four lane dual road. This fact is shown in the above table on the accident rate basis. Then, unaware of the injury or fatality rate, it was assumed as good logic that every accident is a potential fatality. This logic proved to be wrong.

The average driver on a 3 lane road realizes that it is a hazardous road and drives accordingly. He is more careful and, therefore, there are fewer accidents than on a dual road but when an accident does occur on a 3 lane road it is very apt to be serious. On a dual road the driver is less cautious because he is impressed with the idea that the engineer has provided an almost fool-proof highway. The result is that he has more accidents and the ones that occur are apt to be less serious because the engineer did provide safety features.

From this analysis it is concluded that the dual road is the safest type, the 2 lane road next safest, the 4 lane undivided next and the 3 lane road the most dangerous. The 3 lane and 4 lane types should not be recommended for use except as a last resort.

Progress has been made on the New Jersey State Highway system in the reduction of fatalities. The fatality rate for the 3 years 1935 to 1937 varied from 13 to 15. During the next 4 years 1938 to 1941 the fatality rate varied from 9 to 10. Then, the fatality rate varied from 7 to 8 fatalities per 100 M.C.M. for the next 6 years from 1942 to 1947. The trend is downward in New Jersey in spite of an upward trend nationally.

The injury rate experience was not so admirable during the same period although there was a decrease. The 1937 injury rate was 29 percent higher than the 1947 injury rate and the 1937 fatality rate was 114 percent higher than the 1947 fatality rate.

The accident rate in 1947 was 19 percent higher than in 1937. It may be that accident recording has become more efficient. This could account for an increase of accidents reported rather than an increase of accidents occurring.

NEW JERSEY STATE HIGHWAY SYSTEM

ACCIDENT SUMMARY

BY YEARS

Year	Miles	A.A.D.T.	100 M.C.M.	Number of Acc.	Number of Inj.	Number of Fat.	Rate per 100 M.C.M. Acc.	Rate per 100 M.C.M. Inj.	Rate per 100 M.C.M. Fat.
1937	1607.12	5,610	32.8908	8,921	7,569	493	271	230	15
1938	1608.12	5,720	33.5664	8,282	6,787	341	247	202	10
1939	1616.76	5,990	35.3413	8,325	6,354	324	236	180	9
1940	1624.41	6,320	37.4609	10,305	7,432	345	275	198	9
1941	1624.41	6,800	40.3088	12,370	8,832	399	307	219	10
1942	1643.69	5,280	31.7005	6,995	4,672	235	221	147	7
1943	1647.87	3,960	23.8078	4,103	2,881	187	172	120	8
1944	1654.87	4,240	25.6163	4,842	3,460	185	189	135	7
1945	1681.25	4,450	28.1873	6,535	4,334	221	232	154	8
1946	1687.96	6,270	38.6297	9,884	6,340	261	256	164	7
1947	1690.00	6,780	41.8360	13,496	7,439	273	323	178	7
	Fatality rate in 1935 = 14				Fatality rate in 1936 = 13				

Analysis of the rates produces a more comprehensive understanding of the accident experience but the engineer must bear in mind that the ambition is to reduce the number of accidents, injuries and fatalities. A particular road may have a very high fatality rate as a result of a few fatalities in conjunction with a small amount of traffic. Another road may have a very low fatality rate as a result of many fatalities and a very large amount of traffic. The engineer should strive to reduce the fatalities in the second case even though the rate is low, even if this means a neglect of the accidents on the first road.

The fatality rate has been reduced on the entire New Jersey State Highway system from 15 per 100 M.C.M. to 7 per 100 M.C.M. in 10 years. There are many good examples in New Jersey where the rate is much lower than 7. On Route 4 from Paramus to Fort Lee, a distance of 9 miles, the rate was 4 for a 10 year period. For shorter periods it was still less. The Skyway in Hudson County for 10 years had a rate of 3. All New Jersey dual roads in 1946, totaled together, had a rate of 4. These compare with a 9 year rate on the Merritt Parkway in Connecticut of 3. The Boston Post Road for 9 years had a rate of 11. The Pennsylvania Turnpike had a rate of 11 for 6 years. Roads in California average about 15.

The roads in New Jersey having low rates of 3 and 4 are well designed roads but even these are known to have design weaknesses which if corrected would reduce the fatality rate still further. It is quite certain that with best design principles the fatality rate can be reduced to 2 fatalities per 100 M.C.M.

It is impossible to entirely eliminate traffic fatalities because there will always be some drivers who drop dead while driving, with an

accident following, the actual cause of which can never be determined. Also, serious illnesses will occur while driving, with fatal accidents resulting. Also, intentional suicides and murders will be committed with the motor vehicle as the weapon. Also, family arguments, fights between individuals in the car, fights between drivers of two cars, criminals eluding police, falling asleep and the normal share of human weaknesses, all will continue to result in fatalities on the highway.

Extensive analyses have been made of before and after improvements and intersection accidents. Many analyses are non-productive. Attempts have been made to determine the trend of the accident rate with respect to variations in the traffic density. Studies so far indicate no definite trend although logic indicates that the accident rate should increase with increases in traffic density at least up to the point of traffic densities which severely reduce the speed of all cars. We are now making a different type of analysis which shows promise of establishing a trend.

The best accident reporting system is far from being accurate. Where injuries are involved, it may be vitally essential to get the injured to a doctor or hospital. It may be impossible to recall or explain exactly where or why the accident occurred. It may be recorded on a road miles from the actual spot or even on a wrong road. Then, too, what is an accident? By law in New Jersey all accidents involving property damage of $25 or more must be reported but who determines the damage. One estimate may be $20 another may be $70. A $20 damage a few years ago may be worth $40 today. Many accidents are agreeably settled between drivers without reporting them. If a driver wrecks his car or even injures himself without damaging or affecting anyone else's property he undoubtedly does not report it.

It is assumed that all traffic fatalities are reported because they are checked by vital statistics records but an injury may result in the injured one dying the next day or 2 year's later as a result of the accident. Decisions must be made as to whether to classify it as an injury or a fatality.

Conclusions based on fatalities are most reliable but it is difficult to obtain large samples. One or two fatalities do not prove conclusions. The fatality classification is a most positive classification.

Conclusions based on injuries are not as positive as those based on fatalities but significant samples are easier to obtain. Injuries vary from slight injuries, which may be insignificant, to injuries which may have been one heart beat from a fatality.

Conclusions based on accidents only are most unreliable but very large samples are available. It would be very easy to collect data at one intersection, which data would greatly outnumber the accidents recorded at another intersection although the second may actually have more accidents. At some intersections it is quite certain that hundreds of unreported accidents occur during a year. If a concentrated effort is made to observe and record these accidents the data is relatively unreliable but may not be recognized as such.

Accident analyses must be scientifically accurate in order to result in reliability and constructive progress.

W. R. Bellis
March 1953